

# BRAVING THE SEAS

## LIFE ON A NOAA FISHERIES RESEARCH VESSEL

BY DAVID A. BROWN

Sometime between midnight and dawn, Laurie Weitkamp hears a “thump” outside her bedroom. She turns her back to the sound, but it doesn’t go away.

The night is dark and the air chilly. Footsteps and muffled voices resonate nearby. What does she do?

She rolls over and goes back to sleep.

After all, she can’t very well ask the engineers to halt their after-hours engine room maintenance. And as far as the crab pot thumping against the hull, well things like that get caught on transducers now and then.

Such is life on a NOAA research vessel. Driven to the seas by the quest for data that fuels effective fisheries management, Weitkamp knows well the ups and downs of living on the waves.

A biologist with the Northwest Fisheries Science Center, Weitkamp spent five years on NOAA research vessels, including the 93-foot, wooden-hulled *John N. Cobb* (NOAA’s oldest active research ship, built in 1950) and the 175-foot *McArthur* (decommissioned on May 20, 2003). Most recently, she has been conducting research cruises on chartered commercial vessels in the 120-foot range.

Focusing on the estuarine and marine ecology of Pacific salmon, her trips have

taken her up to 30 miles off the coasts of Washington, Oregon, and southeast Alaska into depths of 3,000 feet.

Most trips run 10 days, with the first and last used mainly for transit and the rest occupied with a steady routine of taking water-quality measurements, collecting zooplankton, and trawling for juvenile salmon over predetermined sampling stations.

Research crews on this survey work only the 12 daylight hours, so seasons influence productivity. But a typical cruise can cover approximately 55 stations. “We can sample about six stations a day, and you work the meals in around that,” Weitkamp said.

As Weitkamp attests, you have to really love your work to spend a week and a half away from home in a relatively small environment with very little personal space. As with most jobs, there’s plenty of rote repetition on a research ship – but crews balance the doldrums with anticipation of what the next trawl might deliver.

“It’s not a Jacques Cousteau special on every trip,” Weitkamp said. “We’re doing the exact same thing every day. We’re doing it in different locations, but after awhile, you can do it in your sleep.

“But it’s always exciting because you never know what you’re going to catch. You may catch tons of jellyfish or a 15-foot thresher shark – it’s quite a challenge getting one of those off the deck.”

Many NOAA cruises operate 24 hours per day, depending on their objectives. For Weitkamp, days are best because her targeted juvenile salmon is one of the few species swimming high in the water column when the sun’s up.

Nighttime work sees the upper water layers abounding with hake, mackerels, and other species that stay low during the day. Interesting catches, but the time-consuming exercise of sorting through excessive bycatch would impede Weitkamp’s salmon priority.

But that doesn’t mean the show stops when the sun goes down. One late September evening, a very dark night found Weitkamp and others aboard playing Scrabble in the galley area when a crewman came running below to report that large schools of fish were amassing where the glow of deck lights hit the water.

Just as everyone gathered near the railing, several Humboldt squid appeared with clear predatorial intent. Dashing through the schools of forage, the tentacled terrors provided an unforgettable glimpse of the sea’s daily dramas.

“We watched these 5-foot squid hunting the fish in the lights – it was an incredible sight,” Weitkamp recalled. “Sometimes we saw 30 to 40 squid at one time. The next day, we caught two in the net. So seeing them in hand, changing color from blue to red to black in a matter of seconds, was just amazing.”

Between such moments of excitement, Weitkamp said she and her research



Fisheries surveys aboard NOAA ships operating in the North Pacific often face daunting environmental conditions. Credit: NOAA Central Library Photo Collection

Scientists spend hundreds of hours sorting the catches brought up in NOAA ship survey trawls. Credit: NOAA Central Library Photo Collection



teammates pass their downtime by watching movies and playing board games. Cribbage seems to be a favorite among seafaring types.

Meals are filling and frequent, but research vessels are always “dry” to ensure optimal working conditions.

Most cabins are below decks, so crews don’t see much daylight when foul weather keeps everyone inside. Room arrangements are usually two to a cabin

with a pair of community head and shower facilities.

Weitkamp’s research cruises include four to six scientists – often the same faces each time. Vessel confines foster camaraderie. “There’s a limited number of places to hang out, and you get to know people really well,” she said.

Weitkamp’s Alaskan research cruises target mostly protected waters, but the open ocean off the Washington

Laurie Weitkamp has grown accustomed to life on the water, thanks to five years spent on NOAA research vessels. Credit: Photo courtesy of Laurie Weitkamp



and Oregon coasts can turn nasty in a hurry. She can generally expect at least a couple of bouncy days on each trip.

Rough seas can make deck work challenging and turn temperaments sour. But with sample goals at stake and the clock ticking on the vessel's charter, researchers often have to zip up the foul-weather gear and tough it out. Most trips include a weather day provision, generally exercised when winds exceed 25 knots.



**Left: Assessing fisheries resources requires assessing the environment at each station of a survey, as with this water sampler.**  
Credit: NOAA Central Library Photo Collection **Above: The crew hauls up a trawl net full of pollock during a NOAA groundfish survey.**  
Credit: NOAA Marine and Aviation Operations

joked. "There are some really cool days when we see whales and other incredible sights. But for every one of those, there are 10 hours when absolutely nothing is going on."

Nevertheless, Weitkamp notes that the scenery beats the confines of a terrestrial office. "You get to go see some spectacular areas like southeastern Alaska, where we pull into bays with these giant glaciers. Things you'll probably never see anywhere else."

#### Looking Back

NOAA fisheries research traces its roots to the Bureau of Fisheries steamer *Albatross* – the first vessel built specifically for such tasks by any government. A 234-foot, iron, twin-screw vessel propelled by two independent two-cylinder steam engines, this ship conducted its first scientific cruise in the summer of 1883.

Designed especially for dredging and gathering specimens from all depths, the first *Albatross* achieved world renown for amassing one of the greatest collections of marine organisms ever gathered by a single vessel. The work of the ship's crew

provided data for volumes of scientific publications and no doubt inspired countless others who followed in their footsteps.

In addition to its extensive gatherings, the first *Albatross* made deep soundings, sampled subsurface water, recorded sea temperatures, and measured salinities. With the aid of Edison electric lamps lowered on a 940-foot cable, the crew was able to observe marine organisms at night.

During nearly four decades of service, the first *Albatross's* illustrious career carried it from the Northwest Atlantic to the Caribbean, the Bering Sea to the Galapagos Islands, and throughout western Pacific islands. Complementing its scientific duties, the *Albatross I* was detailed to the Navy during the Spanish-American War and World War I.

Linda Despres of the Northeast Fisheries Science Center in Woods Hole, Mass., has been working on research

vessels since 1973. Noting how the *Albatross's* tools and technology would seem primitive by contemporary standards, she views the work of its scientists with reverent admiration.

"I'm in awe at what they did accomplish," Despres said. "Considering the primitive conditions they had, like the lack of computers, these people were pioneers. They had to develop the technology to take samples and design the equipment they needed."

"And then they were able to produce incredibly detailed information – again without computers or other technology to help with the analyses. This gives us a baseline to compare what we are currently doing. Those findings tell us what things were like at their time – how many fish there were, what sizes there were, what the distributions were."

Weitkamp notes that while those early researchers performed their duties in the same, often harsh, conditions as



"It's always exciting because you never know what you're going to catch," says Weitkamp of her work on NOAA ships.

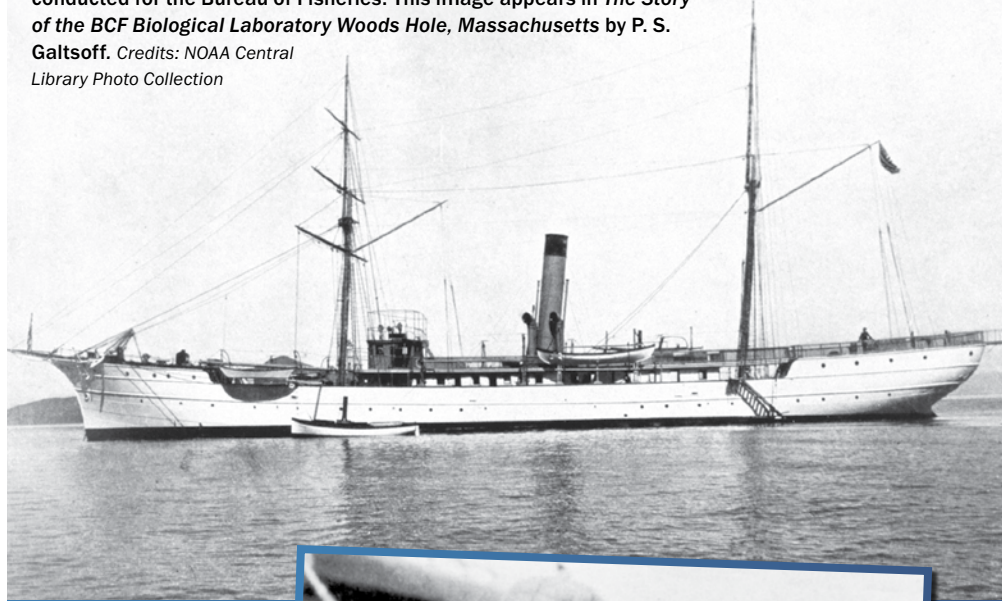
Credit: Photo courtesy of Laurie Weitkamp

Safety is always paramount, but so is the mission's performance. "We're more concerned about the quality of samples we collect," Weitkamp said. "So we're trying to make sure we are sampling consistently."

The appeal of the unknown and the satisfaction of contributing to fisheries management are common motivators for those who ply the seas aboard NOAA research vessels. Weitkamp finds a good blend of challenges and rewards.

"Some days when I'm out there, I can't believe I get paid for doing this, but then there are days they don't pay me enough," she

This photo: Far different from its NOAA descendants, the *Albatross I* set the stage for modern fisheries-science surveying. Below: Henry B. Bigelow, professor at Harvard University, on the deck of the USS *Grampus* during the explorations in the Gulf of Maine (1912-14) conducted for the Bureau of Fisheries. This image appears in *The Story of the BCF Biological Laboratory Woods Hole, Massachusetts* by P. S. Galtsoff. Credits: NOAA Central Library Photo Collection



today's scientists, the challenge of functioning with limited tools and facilities puts an exclamation point on their monumental work.

"It's amazing that they accomplished what they did and gained as much insight as they did without any of the modern electronics and equipment that we have," she said. "Even simple things like raingear that keeps you dry – they were really hardy people."

The spirit of that pioneering vessel continues today, as NOAA's research mission

has spawned a fleet of high-tech vessels tasked with a broad array of exploratory and data-gathering duties. Among them, the 187-foot *Albatross IV* has carried on the heritage of the first *Albatross* through assessment work such as groundfish surveys and ecosystem-monitoring surveys.



Serving the Northeast Fisheries Science Center's Woods Hole Laboratory in Woods Hole, Mass., the ship's operating area includes the Gulf of Maine, Georges Bank, and the continental shelf and slope from Southern New England to Cape Hatteras, N.C. Data generated by the *Albatross IV*'s work

## USING SUBMERSIBLES FOR FISHERIES RESEARCH

There's nothing like getting up close and personal to see someone's true complexion. The same is true for ocean exploration, and when NOAA researchers want a tight look at life beneath the surface, they send in the submersible.

Comprising various forms tasked for specific objectives, submersibles are like souped-up, teched-out underwater go-karts. Packing multiple lights and equipped with tools for hydrographic measurements and sample collection, these vessels also provide viewing ports for scientific observation.

Defying temperature extremes and the crushing pressure of deepwater environments, submersibles enable their small crews to explore otherwise unattainable depths. Peering into the midnight abyss, scientists have discovered and recorded new marine communities living well beyond the reach of daylight.

Exemplifying this capability, Delta Oceanographics' manned submersible, *Delta*, has been highly effective in characterizing rockfish habitat and documenting species distribution and abundance in the Cordell Bank Sanctuary ecosystem off the coast of central California. Launched from the contract research vessel *Velero IV*, the *Delta*'s exploration of this richly diverse marine habitat has influenced its management.

Some of the most famous submersible work was completed in 1975 by the crew of the Helgoland undersea habitat. Working in the Gulf of Maine, scientists from West Germany, Poland, Canada, the United States, and the Soviet Union completed enlightening studies on the spawning behavior of sea herring. Additionally, the mission's highs and lows provided invaluable insight into the strengths and vulnerabilities of undersea habitats.

Submersibles have evolved greatly since the Helgoland, but despite significant developments in safety and functionality, some jobs are better left to remotely operated vehicles (ROVs). Ranging in size from that of a bread box to a small truck, these deep-sea robots connect to a surface vessel with cables that allow an operator to remotely control direction and propulsion, as well as cameras and other task-specific equipment.

Manned submersibles have the advantage of human eyes and firsthand observation, along with greater freedom of motion with no tethering to a surface vessel. But when trouble befalls occupied vessels, ROVs can often render assistance such as removing entanglements or latching onto

a submersible so the operator can raise both units to the surface.

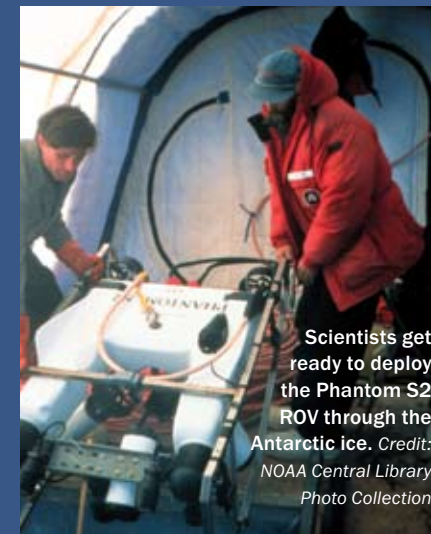
ROVs play back-up and lead roles equally well. When rough weather or maintenance issues keep a submersible from its scheduled mission, an ROV can often substitute. Conversely, deploying an ROV to scout new dive sites reduces the risk to machine and man.

Operated by the NOAA Undersea Research Center (NURC), the S2 Phantom ROV works independently and supports wet-diving and submersible operations. Carrying video and still cameras, sector scanning sonar, and a three-function manipulator arm with multiple sampling attachments, the S2 Phantom measures conductivity, temperature, depth, light transmission, and oxygen with real-time surface readout.

This ROV has proven intrinsic to ground-truthing multi-beam sonar surveys to create habitat maps in the Florida Keys, Flower Garden Banks, and Gray's Reef Sanctuaries, and the Madison/Swanson, Dry Tortugas, Florida Middle Grounds, Oculina Bank, and proposed South Atlantic shelf-edge Marine Protected Areas. The S2 Phantom has also served in fish behavior studies, search and recovery, mapping hypoxic water masses, environmental monitoring, and education/outreach.

Like the Helgoland experience, each time a submersible or ROV enters the ocean, it brings back more than biological samples and water measurement. These ever-evolving deep-sea wonders reveal new ways of prospecting the environmental treasures held in the great abyss.

NOAA Ocean Explorer Program, Submersibles — <http://oceanexplorer.noaa.gov/technology/subs/subs.html>



Scientists get ready to deploy the Phantom S2 ROV through the Antarctic ice. Credit: NOAA Central Library Photo Collection

help explain the physical and biological processes affecting year-class strength of key economical fish, shellfish, and zooplankton species.

### A New Breed

Making a big splash in marine research, the *Henry B. Bigelow* – the second in a quartet of technology-rich vessels – represents NOAA's efforts to modernize its fleet of fisheries, oceanographic, and hydrographic survey ships.

Notably, the ship's namesake, Henry Bryant Bigelow, directed the final scientific voyage of the first *Albatross*. A Harvard-educated zoologist, Bigelow helped establish the scholarly foundation for oceanography as a scientific discipline.

At 208.6 feet, the *Henry B. Bigelow* epitomizes 21st century research with cutting-edge equipment designed to measure water temperature, conductivity, and fluorescence; deploy and recover floating and bottom-moored sensors; and trawl at depths to 6,000 feet. Working primarily in U.S. waters from Maine to North Carolina, the *Henry B. Bigelow* can carry a crew of 39, including 19 scientists, with a 40-day endurance.

Fit for the task, the *Henry B. Bigelow* includes a 1,560-square-foot aft working deck, a 602-square-foot fish/wet laboratory along with four other labs (chemistry, dry, hydrographic, and acoustic/computer), a scientific freezer, and a preservation alcove. An Acoustic Doppler Current Profiler measures water currents, while a multibeam sonar system examines the content of the water column, as well as the type and topography of the seafloor while the ship is underway.

Most significant is the vessel's stealth. Built to be acoustically quiet, the ship has a very low radiated noise signature. Studies have shown that underwater radiated noise affects fish behavior, and sonar self-noise can impair functions such as hydroacoustic surveys.

Setting the bar for marine research worldwide, the International Council for Exploration of the Seas (ICES) has established a standard for ships' underwater radiated noise in order to effectively employ hydroacoustic stock-assessment techniques. The *Bigelow* was built to keep its radiated noise below the ICES standard.

Chuck Byrne, vessel coordinator for NOAA's Northeast Fisheries Science Center, was involved in the design and outfitting of the *Bigelow*. "We're moving into the next generation of research vessel," he said. "We're increasingly employing remote sensing technology, which senses the subject without capturing it.

"If we're going to do that effectively, we need a platform that will allow us to study these animals without affecting their behavior while they're being studied. That's what this ship gives us."

As Byrne notes, the *Bigelow*'s remote sensing technology will allow more marine organisms to remain in their habitat, even though they've contributed to scientific studies.

"We use the trawl to quantify what we're seeing, because we still have to collect biological samples to study such things as pathology and maturity, but we won't have to do it with the same frequency," he said. "This technology also helps us get closer to marine mammals than we ever have. So, we're improving estimates of not only fish species, but also of other protected species."

The *Henry B. Bigelow* will work primarily in U.S. waters from Maine to North Carolina. In addition to its undersea surveys, the ship will also observe weather, sea state, and other environmental conditions; conduct habitat assessments; and survey marine mammal and marine bird populations.

Since the days of the first *Albatross*, the driving force behind NOAA's continuous development in its survey vessels has always been an unquenchable thirst for the knowledge integral to responsible marine stewardship.

NOAA Marine and Aviation Operations, NOAA Fleet — [www.omao.noaa.gov/visitors.html](http://www.omao.noaa.gov/visitors.html)

NOAA Photo Library, Sailing for Science — [www.photolib.noaa.gov/ships/index.html](http://www.photolib.noaa.gov/ships/index.html)

Northeast Fisheries Science Center, Research Vessel Surveys — [www.nefsc.noaa.gov/sos/vesurv/vesurv.html](http://www.nefsc.noaa.gov/sos/vesurv/vesurv.html)